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Reserves Estimating Carbon in Forest City District Village Bongohulawa Gorontalo

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ABSTRACT: *The estimation of Carbon stock and carbon sink in the City Forest of Bongohulawa village, Regency of Gorontalo (Guided by. The research was aimed to know volume growth of trees planted in the Village District Bongohulawa Gorontalo, to calculate the volume and content of carbon biomass in the city forest and green line (left-right path) and average carbon sequestration/tree/species. Research was conducted in village of Bongohulawa during 4 (fourth) month; started from March until June 2011. The execution of data collecting [of] was performed within this research area-location through observation and measurement of trees and forest stand. For green line research area 100% inventory was upllied and for City Forest line plot sampling was implemented. For city forest sample plots measurement was conducted in 10 sample units (each unit sampling of 0.25 ha). Tree diameter, tree hight (total and commercial hight) and crown diameter of all tree species within research line (green line) and research plots (city forest) was measured. Based on the research data and its calculation, the results show that: Casuarina junghuhiana can store more carbon than other tree species. From the inventory conducted in 3 km of green line along the road (6 meters width observations) of the village Bongohulawa, 366 trees (consist of 7 tree species) were measured. Those tree species namely Casuarina junghuiana 102 trees, sandalwood 46 trees, mango 7 trees, jackfruit 6 trees, Albizia 1 tree, mahogany 202 trees, headland 2 trees. Crown cover of those tree species is 3032.54 m^2. The result of calculation also indicated that Casuarina has higher carbon stock than other tree species that is 33.56 tons (equal with 52% of total crbon stock). Further calculation indicated that during the period of 19 years (since 1992) Casuarina can strocked carbon average of 1.77 tons/year. The average diameter increment of individual Casuarina tree species is about 1.72 cm/year. Furthermore, for Swietenia magrophilla King, with an average diameter increment of 1.40 cm/year, the leaves of this tree species can absorbed carbon of 18.1233 tons within green line of both sides of the road. For research plots within City Forest which located in the valey the results of the research show that the crown cover of 124 trees is about 1,359.67 m2, then carbon absorbtion is about 0.15 ton/tree or about 7.8 kg/tree/year. Within the research area of City Forest (located both in the valey and hill) totally there are 1,353 trees (consist of 13 tree species) and carbon absorption of the canopy is about 25.521 tons. Further calculation results also indicated that carbon absorption of small trees (poles) is about 25.521 tons and for sapling is about 78.163 tons or 39,0815 tons/ha then fionally for mature trees is about 39.813 tons or 15,925 tons/ha.*

KEYWORDS: *Measurement, Carbon Stock, in Forest City,*

I. RESULTS AND DISCUSSION

The results of measurements that have been done on planting the right side of the road along the 3 (three) Km it was found that 102 trees mountain pine (*Casuarina junghuhiana*) can produce large biomass that is equal to 72.9526 tonnes. 202 mahogany trees with biomass 46.8238 tons, Sandalwood 46 13.6502 tons of tree biomass. This data can be seen that the total volume of 52.61 m³ Casuarina and Mahogany 54.8716 but different content of this biomass due to differences in density (Bj) Casuarina Mahogany Bj 1.04 and 0.64. With estimates of carbon stored is the concentration of C in organic materials is typically around 46% of the weight of the timber. Thus it can be counted next C content for other tree species. Casuarina absorb carbon 33.56 tons of trees 366, 202 tonnes from 21.54 Mahogany tree, sandalwood 6.28 tons of trees of 46 tree, because the uneven number of trees that need calculating the average. Analysis of data (measurements of trees) on the left - right the way village. Bongohulawa along 3 km (3000 m) with a track width of 5 m. Location

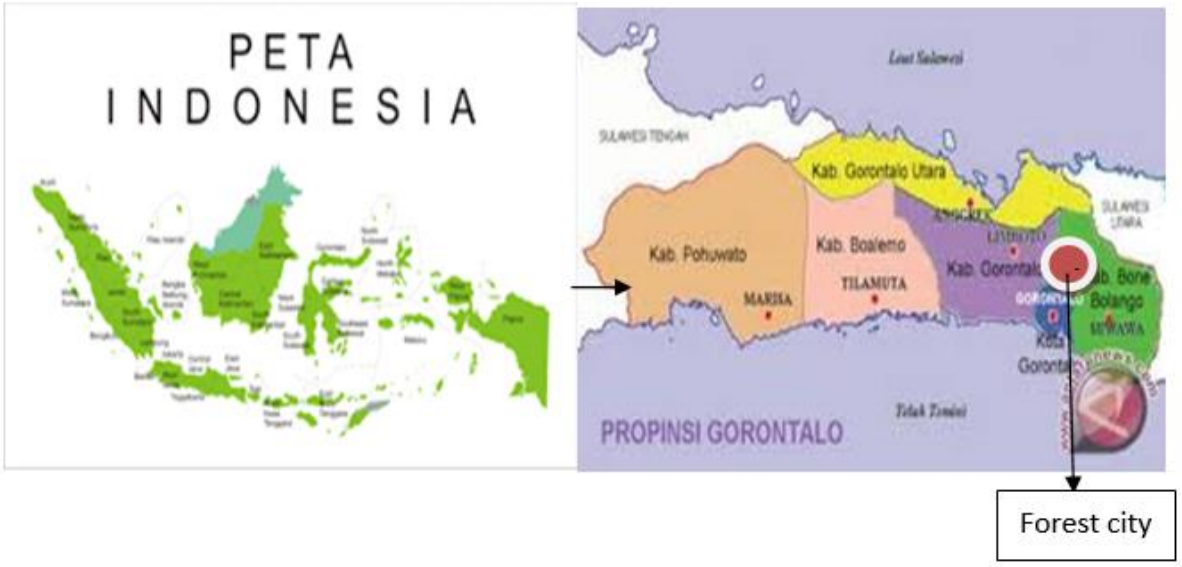

Table 1. Results of the calculation of the average absorption of carbon per tree / year

Tree Type	Amaunt trees	Average Biomassa /tree(tons)	Average/tree C=0.46xB (tons)	Average C/tree/year (tons)
Cemara/ *Casuarina junghuiana,Mig*	102	0,7152	0,3290	0,0173
Cendana/*Santalum album.Lann*	46	0,2967	0,1365	0,0072
Mangga/*Mangifera indica L*	7	0,1457	0,0671	0,0035
Nangka/*Artocarpus integra Merr*	6	0,2383	0,1100	0,0058
Sengon laut/*Leucaena leucodendron*	1	2,3400	1,0800	0,0568
Mahoni/*swietenia macrophylla.King*	202	0,2318	0,1066	0,0056
Tanjung/*Mimosops elengi*	2	0,0250	0,0100	0,0005

The calculation of the average carbon stocks per tree per year based on the age of the plant 19 years since the planting year (1992) to study (in 2011). Above that the average carbon absorbed by the trees on the mountain pine is 0.3290 ton / tree, sandalwood 0.1365 ton / tree and Mahogany 0.1066 ton / tree. The left side of the road or the overall area of 18,000 m2, obtained the number of trees 366 trees in each species as follows: Pine Mountain 102 trees, Sandalwood 46 trees, Mango 7 trees, jackfruit 6 trees, Sengon sea 1 tree, Mahogany 202 trees Tanjung two trees. and canopy closure of all species is 3032.54 m2 from the above calculation results obtained that the pine trees store carbon 0.0173 ton / tree / year, equivalent to 17.30 kg / tree / year, for 19 years since 1992. The sea Sengon 0.0568 ton / tree / year (only one tree), Sandalwood 0.0072 ton / tree / year, Mango 0.0035 ton / tree / year, Nangka 0.0058 ton / tree / year, Mahogany 0.0056 ton / tree / year, Tanjung 0.0005 ton / tree / year. To get an idea of the distribution of carbon uptake per tree species Figure 5 presents research locations on either side of the road

Biomass Carbon At Forest City's most high-biomass content is Mahogany amounted to 15.56 tons and basal area (LBD) 4.95 m², 649 m canopy closure of 66 trees and followed johar 14.94 tonnes to 3.59 m² of 72 trees , Pecan LBD 2.84 tons with 1.47 m², closing canopy136,29 m of 11 trees and Gmelina 2.90 tons, LBD 1.18 m², canopy closure of 17 150 m of 2.22 tons of Acacia trees and biomass, LBD 1.05 m², canopy closure of 121 m. Furthermore, Even Mahogany more carbon sequestration but larger than the others. estimation of biomass and carbon from each type of trees making up the existing trees in the urban forest, shows that the uptake Mahogany carbon by 7.16 tons and 6.87 tons Johar absorption, has a greater carbon uptake compared with other types of groups, such as Pecan 1.31 tons, Gmelina 1.33 tons, 1.02 tons of Acacia. Based on the calculation above where carbon uptake Mahogany and Johar have the greatest carbon absorption. Medium Gmelina, Pecan, Acacia, a group of species, less absorption carbonnya, it can be used as a material consideration in planning (the choice of) planting urban forests.

To get an idea about the reserve of carbon in a unit time for each individual tree, as a record of the results of these calculations turned out Trembesi including the Big 5 in the uptake of carbon, hence the tree recommended by President Susilo Bambang Yudhoyono as reforestation trees in the 1 billion trees (in order of decreasing carbon emissions 26%). Furthermore, the graph below provides a visual overview of carbon uptake tree species mentioned above.

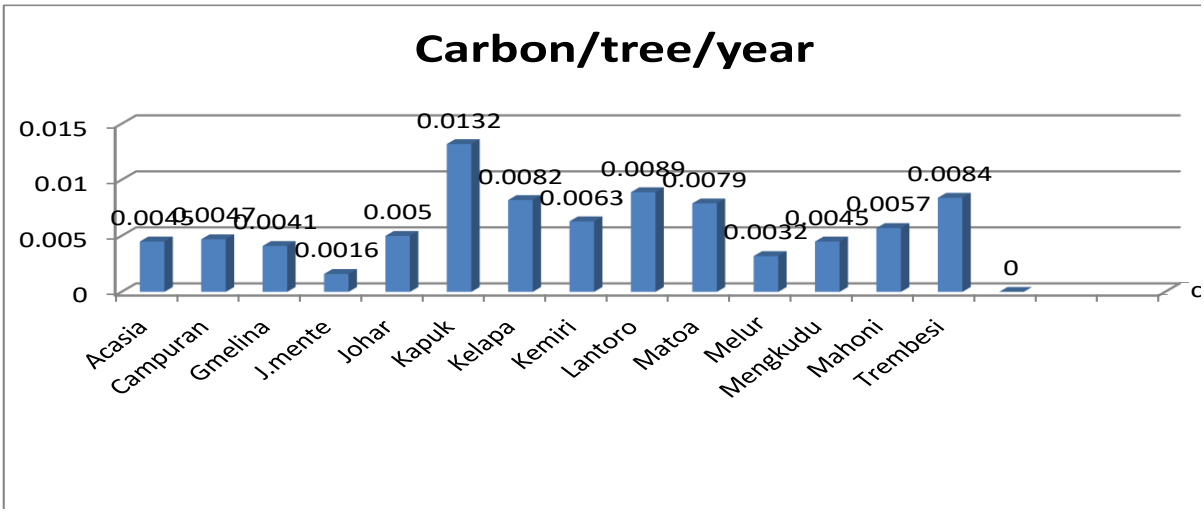

Figure 1. Average Carbon uptake

From the above picture can be seen that the average Kapuk absorb carbon 0.0132 / tree / year, Mahogany 0.0057, Lantoro 0.0089, 0.0084 Trembesi, Coconut 0.0082, 0.0079 Matoa carbon / tree / year, the total yield of carbon can be seen in Table 17. Namely carbon uptake, Mahogany 7.16 tons (66 trees), Johar 6.87 tons (72 trees), Pecan 1.31 tons (11 trees), Gmelina 1.33 tons (17 tree), and Acacia 1.02 tons (12 trees), other types of> 1 ton. To estimate the biomass that header in the study used the equation Adinugroho, et al (2006) in Sutaryo.D (2009), namely: Y = 0.0138 x p D ^ 1.93. 30 The following table presents the calculation results of biomass canopy of trees making up stands at the site of the left side of the road.

II. CONCLUSIONS AND RECOMMENDATIONS

Conclusion The results of measurement and observation in the study site and the calculation and analysis, can be summed up as follows: the average volume of trees in the green belt as much as 366 rods is 0.350 m3 / tree has an average of biomass of 0.378 tons / tree, which Casuarina junghuhiana (Pine Mountain) has biomass the biggest in the amount of 0.715 tons / tree with the uptake of carbon by 0.329 tons C / tree or by 0.0173 ton / tree / year (over a period of 19 years), as well as for the urban forest biomass Aren 0.56 tons and averaging /tree 0, 2576 tons with the average carbon / tree / year ton 0.0135, 0.3767 tons biomass Noni, the average carbon 0.1733 and the average carbon / tree / yr 0.0091 tons, averaging Trembesi 0.3500 tons of biomass, the average carbon 0, 1616 tons, and the average per ton 0.0085. Mahogany averaging 0.3453 tons of biomass, the average carbon 0.1589 tons and the average carbon perpohon / year 0.0083 tons. Medium Coconut biomass 0.2917, 0.1342 tons of carbon the average, the average carbon / tree / yr 0.0071 tons, the type of plants that have carbon uptake better than other plants of all types that exist in the urban forest study site is Kapuk, Aren , Noni, Trembesi, Coconut, Matoa, Lantoro, and Pecan. Being on the green line more carbon absorption in Pine Mountain, Sengon sea and Mahogany and type of planting to the green line is the Cape, Mahogany, Johar, Matoa, Plants for the garden and yard is kind Jackfruit, Mango, Tamarind, and Jambu mente. Plants on the beach is the sea Casuarina.

Suggestion: For reforestation or urban forests can be combined several types, considering the beauty of the canopy, the absorption of carbon and additional results from the tree by using several types such as Kapok (*Ceiba petandra*), Matoa (*Pometia pinnata*) Lantoro, Coconut, Trembesi (*Samanea saman*), Aren (*Arenga pinnata*), Kemiri (*Aleurites molucana*), Mahogany (*Swietenia macrophylla*), Sengon sea (*Leucaena Sp*) and Johar (*Cassia siamea*) in choosing the type needs to be studied in advance at least meet the criteria, the uptake of carbon, crown, has the aesthetic value , has a beautiful flower, a fruit that is not too big, strong wind and long-lived especially be true in the corner of the crossroads and population growth, the need for infrastructure life (recreation, etc.), in line with the growth of population and vehicles that have not been assessed, could

studied more deeply as a consequence of the development of urban communities. Keyword: "Estimating carbon Bongohulawa Gorontalo"

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